Precursor of isotropic photonicgap obtained in circular photonic crystal

N. Horiuchi, Y. Segawa, T. Nozokido [a], K. Mizuno [a], and H. Miyazaki [a]
Photodynamics Research Center, RIKEN, 519-1399, Aoba, Aramaki, Sendai, 980-0485, Japan horiuchi@riken.jp, Tohoku Univ.[a]

The isotropic photonic gaps (PG) can be obtained in a circular photonic crystal (CPC) which is composed of alumina rods[1]. For the non-periodic lattice array system, a short-range order seems to contribute the formation of PG, because the position of the PG depends on the minimum distance between the rods in CPC. In this study, the relative wave intensity $|E|^2$ between two dielectric rods is measured to investigate the origin of the isotropic PG. A millimeter wave was irradiated to a pair of parallel alumina rods (radius r = 3mm, distance d = 9 mm, refractive index n =3.1) in the direction θ from the alignment line. Even though θ is as large as 30º, the precursor of the PG was observed in the spectrum. Considering each mode profile inside the dielectric rods at the frequencies (9 and 14 GHz), it turns out that the formation of the PG is associated with Mie resonance between two dielectric rods.

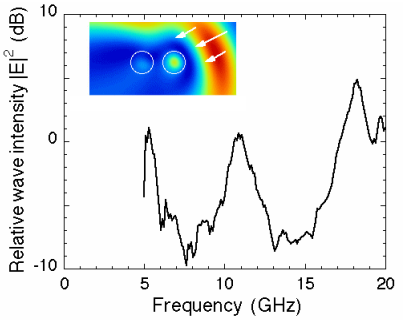

Fig. Relative wave intensity spectrum obtained at the center of the two rods (θ = 30º). Inset is the calculated intensity distribution around the rods.

[1] Horiuchi et al., Opt. Lett. **29**, 1084 (2004).